

MEMORY CARDS

INTRODUCTION

It's impossible to have too much flash memory. As digital cameras get better, the pictures they take use more and more storage space, but the cards supplied with most are tiny. By adding a larger memory card you can take lots more pictures, allowing you to shoot whenever you want rather than rationing your photos. Many mobile phones now have integrated cameras and music players, but to make the most of either you'll need plenty of memory. Adding a memory card to your smartphone will allow you to store more applications, more files or more music to listen to on the move.

Unfortunately, memory cards come in many different formats, sizes, prices and speeds. This can make it tricky to know where to start looking, let alone which to buy. This month we've assembled dozens of the latest memory cards suitable for smartphones, PDAs, MP3 players and cameras, and tested each one. However you plan to use your increased memory, we'll help you find an ideal card at a low price.

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THANKS FOR THE MEMORY

If you're looking for more flash memory but don't know where to start because of the sheer choice, our review of the latest cards will point you in the right direction

Choosing a... Memory Card

When choosing a memory card, it's tempting to make your decision based on format and price alone. This isn't necessarily a good idea, though. The cheapest SD card in this test, for example, takes twice as long to save data as the fastest. In this guide we'll explain what else to look for when buying.

SIZE MATTERS

Most types of memory card are available in capacities of up to 2GB. SD cards with 4GB and 8GB capacities are available, but few manufacturers make them and they don't work in all devices. For this test we wanted to review the best-value cards in each format that provide ample space for the future, so we've tested the largest capacity of each with mass-market pricing. This is 1GB for xD cards and most smaller formats, and 2GB for SD and Memory Stick Pro Duo cards.

A 2GB memory card is enough for around 500 eight-megapixel photos in JPEG format or 500 songs in MP3 format. Most recent cameras will accept 2GB cards, but if you're using an older camera it's important to check compatibility before you buy. If you need a smaller capacity, the table on pages 116-117 lists which are available and how much each one costs from the supplier listed.

NEED FOR SPEED

Some memory cards are rated in terms of speed. Cheaper cards usually have no speed rating, but high-speed cards are rated in multiples such as 60X. To translate this into megabytes per second (MB/s), you multiply the speed rating by 0.15, so a 60X card is rated to run at 9MB/s. Speed ratings can be misleading, though. To find out how quickly each card can read and write files, see our benchmarks on pages 118 and 120.

There are two reasons to buy a high speed-rated card. First, a faster card should make transferring data to and from your PC much quicker when using a USB card reader. In our tests, the quickest cards were seven times faster to copy photos from than the slowest cards. Second, having a fast card is useful if you use your camera in RAW or continuous mode. Each picture in RAW mode takes up over 20MB of storage, so it's important to have a card that can save data quickly.

If you use your camera in continuous shooting mode, it will start by saving pictures to an internal memory buffer. When this runs out, though, it will start copying them to the memory card. If your card can't keep up, the camera will be forced to slow down. You can see which cards slowed down our test cameras in the Continuous photo test graph on page 120.

MEMORY CARDS

MICRO SD CARDS



MANUFACTURER	CRUCIAL	CORSAIR	TRANSCEND	CRUCIAL	KINGSTON	SANDISK
Model	1GB microSD	1GB microSD	1GB microSD	1GB miniSD	1GB miniSD Card	miniSD Card 1GB
Rating	★★★★★	★★★★★	★★★★	★★	★★★★	★★★★
Pros	Cheap; fast	Cheap; fast	Fast	Cheap	Fast; good value	Very fast
Cons	None	None	Slightly expensive	Slow write and continuous shoot speeds	None	Marginally more expensive than others
Format	MicroSD	MicroSD	MicroSD	MiniSD	MiniSD	MiniSD
Capacity	1GB	1GB	1GB	1GB	1GB	1GB
Quoted speed	Not stated	Not stated	Not stated	Not stated	Not stated	Not stated
Other capacities (prices include VAT)	512MB (£8)	512MB (£6), 2GB (£35)	None	256MB (£7), 512MB (£8), 2GB (£16)	256MB (£5), 512MB (£7)	512MB (£9), 2GB (£26)
Lock switch	No	No	No	No	No	No
Accessories included	MicroSD-to-SD adaptor	MicroSD-to-SD adaptor	MicroSD-to-SD adaptor	MiniSD-to-SD adaptor	MiniSD-to-SD adaptor	MiniSD-to-SD adaptor
Price inc VAT	£8	£9	£12	£9	£11	£13
Warranty	Lifetime	Lifetime	Unknown	Lifetime	Lifetime	Five years
Supplier	Crucial 08000 130330	www.scan.co.uk	www.mobymemory.com	Crucial 08000 130330	www.dabs.com	www.mymemory.co.uk
Details	www.crucial.com/uk	www.corsairmemory.com	www.transcendusa.com	www.crucial.com/uk	www.kingston.com	www.sandisk.com
Part code	CT1GBUSD	CMFSDMICRO-1GB	TS1GUSD	CT1GBMSD	SDM/1GB	SDSDM-1024

MS MICRO M2 CARDS

MS PRO DUO CARDS



MANUFACTURER	SANDISK	SONY	SANDISK	SONY	SANDISK	SANDISK
Model	Memory Stick Micro - M2 1GB	Memory Stick Micro - M2 1GB	Standard Memory Stick Pro Duo 2GB	2GB Memory Stick Pro Duo	Ultra II Memory Stick Pro Duo 2GB	Extreme III MS Pro Duo 2GB
Rating	★★★	★★★★	★★★	★★	★★★★★	★★★
Pros	Inexpensive	Fast	Reasonable value	Reasonable value	Fairly fast	Very fast
Cons	Slow write speed	Expensive	Slow	Extremely slow	Quite expensive	Very expensive
Format	MS Micro M2	MS Micro M2	MS Pro Duo	MS Pro Duo	MS Pro Duo	MS Pro Duo
Capacity	1GB	1GB	2GB	2GB	2GB	2GB
Quoted speed	Not stated	Not stated	Not stated	Not stated	150X	120X
Other capacities (prices include VAT)	512MB (£14), 2GB (£44)	512MB (£15)	512MB (£15), 1GB (£19), 4GB (£71)	512MB (£19), 1GB (£23), 4GB (£73)	1GB (£31), 4GB (£106)	1GB (£43)
Lock switch	No	No	No	No	No	No
Accessories included	MS Micro-to-MS Pro Duo adaptor	MS Micro-to-MS Pro Duo adaptor	MS Pro Duo-to-MS adaptor	MS Pro Duo-to-MS adaptor	MS Pro Duo-to-MS adaptor	Carry case and recovery software, MS Pro Duo-to-MS adaptor
Price including VAT	£18	£27	£35	£40	£50	£75
Warranty	Five years	Five years	Five years	Five years	Five years	Five years
Supplier	www.mymemory.co.uk	www.mymemory.co.uk	www.dabs.com	www.mobymemory.com	www.dabs.com	www.dabs.com
Details	www.sandisk.com	www.sony.co.uk	www.sandisk.com	www.sony.co.uk	www.sandisk.com	www.sandisk.com
Part code	SDMSM2-1024	MS-A1GW	SDMSPD-2048	MSXM2GSX	SDMSPDH-2048	SDMSPDX3-2048

RS-MMC CARDS

XD CARDS



MANUFACTURER	KINGSTON	MYMEMORY	FUJIFILM	TOSHIBA	OLYMPUS	OLYMPUS
Model	1GB MMCmobile Card	MMC Mobile 1GB	XD Type H 1GB	XD Type M 1GB	XD Type M 1GB	1GB xD Picture Card Type H
Rating	★★★★★	★★★★★	★★★★★	★	★★★	★★★
Pros	Fast read and write speeds	Fast read, write and delete speeds	Fast; good value	None	Fastest xD read speed	Fastest xD write speed
Cons	Slightly slower delete speeds	None	None	Slow and expensive	Expensive	Slowest xD read speed; expensive
Format	RS-MMC	RS-MMC	xD	xD	xD	xD
Capacity	1GB	1GB	1GB	1GB	1GB	1GB
Quoted speed	Not stated	Not stated	Not stated	Not stated	Not stated	Not stated
Other capacities (prices include VAT)	512MB (£8)	None	512MB (£10)	None	512MB (£14), 2GB (£45)	256MB (£13), 512MB (£15), 1GB (£20)
Lock switch	No	No	No	No	No	No
Accessories included	RS-MMC-to-MMC adaptor	RS-MMC-to-MMC adaptor	None	None	Six xD card holder	Six xD card holder
Price inc VAT	£15	£15	£10	£18	£18	£20
Warranty	Lifetime	Five years	Five years	One year	One year	One year
Supplier	www.dabs.com	MyMemory 08718 737899	www.mymemory.co.uk	MyMemory 08718 737899	www.mymemory.co.uk	www.crucial.com/uk
Details	www.kingston.com	www.mymemory.co.uk	www.fujifilm.co.uk	www.mymemory.co.uk	www.olympus.co.uk	www.olympus.co.uk
Part code	MMCM/1GB	MMMMCM1GB	P10N075450A	XD-01G-T	M-XD1GM	CT5SWAF8U

SD CARDS



MANUFACTURER	KINGSTON	CORSAIR	MYMEMORY	CRUCIAL	KINGSTON	CORSAIR
Model	2GB Secure Digital Card	2GB Secure Digital 60X	2GB 133X SD Card	2GB Secure Digital	Elite Pro Secure Digital Card (50X)	2GB Secure Digital Superfast 133X
Rating	★★	★★	★★	★★★★	★★★★★	★★★★★
Pros	Very cheap	Very cheap	Very cheap	Inexpensive	Fast read speed; good value	Fast read and write speeds; good value
Cons	Very slow	Very slow	Very slow	Fairly slow write speeds	None	None
Format	SD	SD	SD	SD	SD	SD
Capacity	2GB	2GB	2GB	2GB	2GB	2GB
Quoted speed	33X	60X	133X	40X	50X	133X
Other capacities (prices include VAT)	256MB (£3), 512MB (£5), 1GB (£7)	256MB (£6), 512MB (£9), 1GB (£7)	1GB (£8), 4GB (£28)	128MB (£6), 256MB (£7), 512MB (£7), 1GB (£9)	512MB (£6), 1GB (£8)	512MB (£9), 1GB (£12)
Lock switch	Yes	Yes	Yes	Yes	Yes	Yes
Accessories included	None	None	None	None	None	None
Price including VAT	£11	£13	£13	£16	£17	£22
Warranty	Lifetime	Lifetime	Five years	Lifetime	Lifetime	Lifetime
Supplier	www.ebuyer.com	www.scan.co.uk	MyMemory 08718 737899	Crucial 08000 130330	www.ebuyer.com	www.scan.co.uk
Details	www.kingston.com	www.corsairmemory.com	www.mymemory.com	www.crucial.com/uk	www.kingston.com	www.corsairmemory.com
Part code	SD/2GB	CMFSD60-2GB	SD2GB	CT2GBSD	SD/2GB-S	CMFSD133-2GB
     						

MANUFACTURER	KINGSTON	MOBY MEMORY	TRANSCEND	SANDISK	SANDISK	SANDISK
Model	Ultimate Secure Digital Card (120X)	2GB Hi-Speed 150X SD	2GB Hi-Speed 150X SD card	Standard SD 2GB	Ultra II SD 2GB	Extreme III SD 2GB
Rating	★★★	★★★★★	★★★★★	★	★★	★★★
Pros	Fastest SD read speed	Fast read and write speeds; good value	Fast read and write speeds; good value	None	None	Very fast write speed; fast read speed; software included
Cons	Mediocre write speed	None	None	Slow; poor value	Mediocre speed; poor value	Very expensive
Format	SD	SD	SD	SD	SD	SD
Capacity	2GB	2GB	2GB	2GB	2GB	2GB
Quoted speed	120X	150X	150X	Not stated	66X	133X
Other capacities (prices include VAT)	None	1GB (£15), 4GB (£35)	None	1GB (£14), 4GB (£47)	None	None
Lock switch	Yes	Yes	Yes	Yes	Yes	Yes
Accessories included	None	None	None	None	None	Carry case and recovery software
Price including VAT	£23	£23	£24	£25	£27	£38
Warranty	Lifetime	Five years	Five years	Five years	Five years	Five years
Supplier	www.dabs.com	www.mobymemory.com	www.mobymemory.com	www.dabs.com	www.dabs.com	www.dabs.com
Details	www.kingston.com	www.mobymemory.com	www.transcendusa.com	www.sandisk.com	www.sandisk.com	www.sandisk.com
Part code	SD/2GB-U	None	TS2GSD150	SDSDB-2048	SDSDH-2048	SDSDX3-2048
     						

What's your type? Memory card formats explained

There are four main types of memory card: Secure Digital (SD), Memory Stick (MS), MultiMedia Card (MMC) and XD. These names and acronyms are confusing enough, but to make matters trickier still many are available in different sizes. SD cards are available in three sizes. Standard-sized SD cards are most commonly used in digital cameras. There are two types available: SD and SDHC. Standard SD cards will work in any device with an SD slot. SD High Capacity, or SDHC, cards are available in capacities of 4GB and 8GB. Not all cameras with an SD slot can use these newer cards, so check your camera's manual before buying one. Some DSLR cameras can be upgraded with new firmware to support SDHC cards.

As well as SD and SDHC cards, there are two smaller types of Secure Digital memory.

MiniSD cards are around half the size of a standard SD card. They are commonly used in devices such as smartphones and PDAs.

MicroSD cards are even smaller. Sometimes known as TransFlash cards, microSD cards are commonly used in smartphones and MP3 players. Both miniSD and microSD cards usually include an adaptor that allows them to fit into a standard SD slot.

Memory Stick, or MS, is Sony's proprietary memory card format. Memory Stick cards are used in almost all Sony mobile phones and digital cameras, and many Sony Vaio computers have a Memory Stick reader built in. Memory Stick and Memory Stick Pro are now relatively rare, so we've tested the newer and more common Memory Stick Pro Duo cards. These are used in Sony digital cameras and the PSP games console. We've also tested

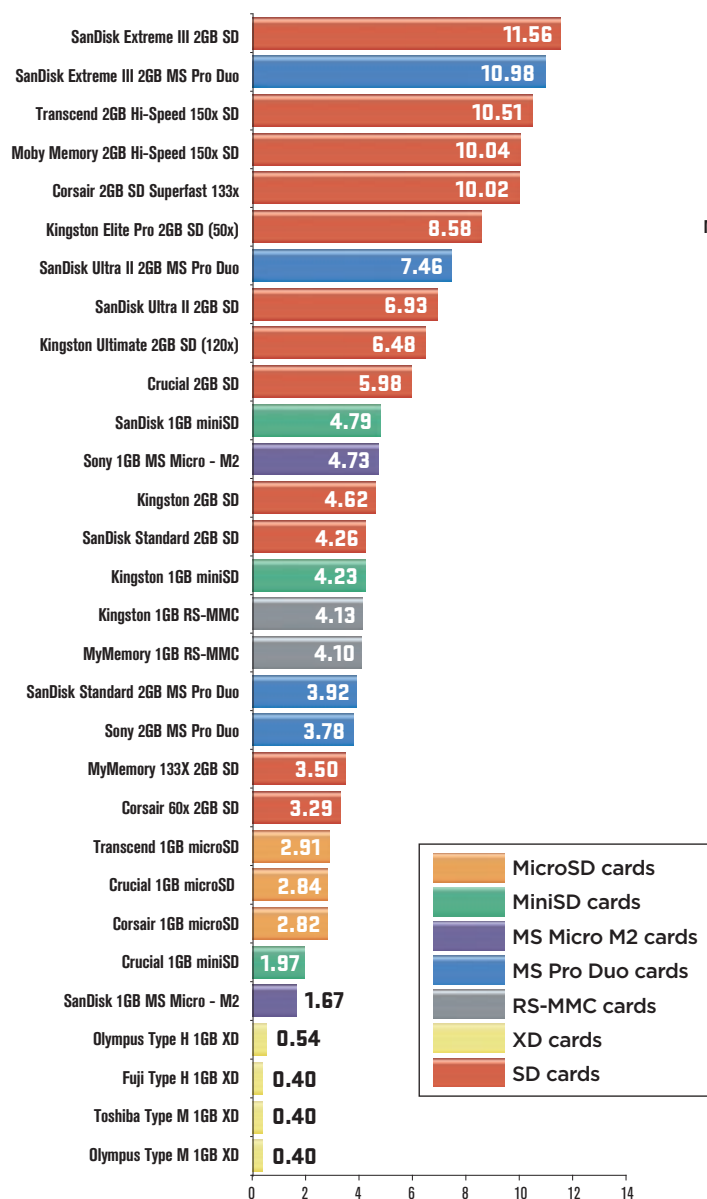
some of the tiny new Memory Stick Micro M2 cards, as used in the latest Sony Ericsson mobile phones.

We've also tested xD and RS-MMC cards. XD cards are used in certain compact Fuji and Olympus cameras. They are available in two types: Type M and Type H. Type M is available in capacities up to 2GB, but 2GB Type H cards are available only in Japan. However, Type H cards are slightly faster than Type M. More confusingly still, not all Type M and Type H cards are compatible with all cameras. You'll find a list of compatible Olympus cameras at <http://tinyurl.com/ybmg9t> and Fuji cameras at <http://tinyurl.com/ydal4j>. RS-MMC cards are used in some older Nokia smartphones, including the N70. They're sometimes known as MMC Mobile cards.

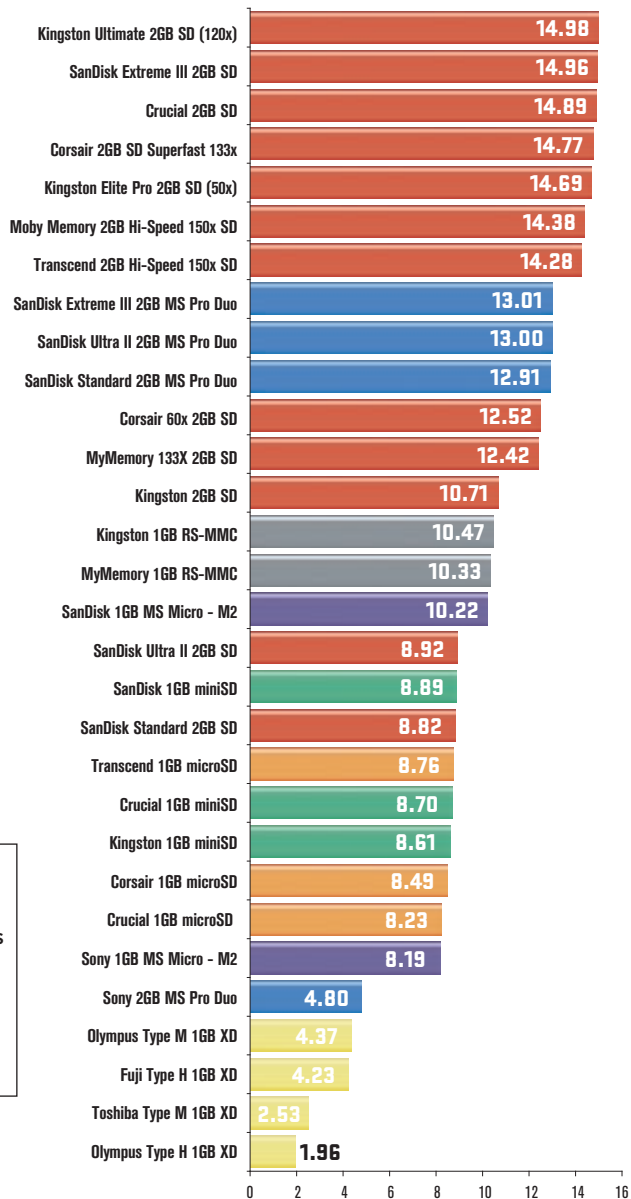
BENCHMARKS

Transfer speeds Read and write tests

File write test (MB/s)



File read test (MB/s)



How we test Memory cards

We performed a number of timed tests to see how quickly each memory card could read and write data. Each card was tested using the same standard computer in order to ensure that the results for each are fair and comparable.

As memory cards are most likely to be used to store images and music, all our tests involved copying a 501MB collection of music and image files. We copied the collection of files to each memory card using a SanDisk ImageMate USB card reader, timing the process. With this completed, we then timed how long it took to copy the files back to our test PC, and then to delete them from the card. We used these times to

calculate speeds in MB/s for reading, writing and deleting files from each card.

Many digital cameras can shoot photos continuously, capturing a series of images. This is ideal for photographing sports, wildlife or your children as they rush around. Some digital cameras write each photo directly to the memory card, but some high-end cameras have a memory buffer and write to the card only when the buffer is full. If the camera can't write photos to the memory card quickly enough, the buffer will remain full and the camera's shooting rate will slow down.

To see if the cards were quick enough to keep up with a digital camera shooting in continuous mode, we timed how long it took

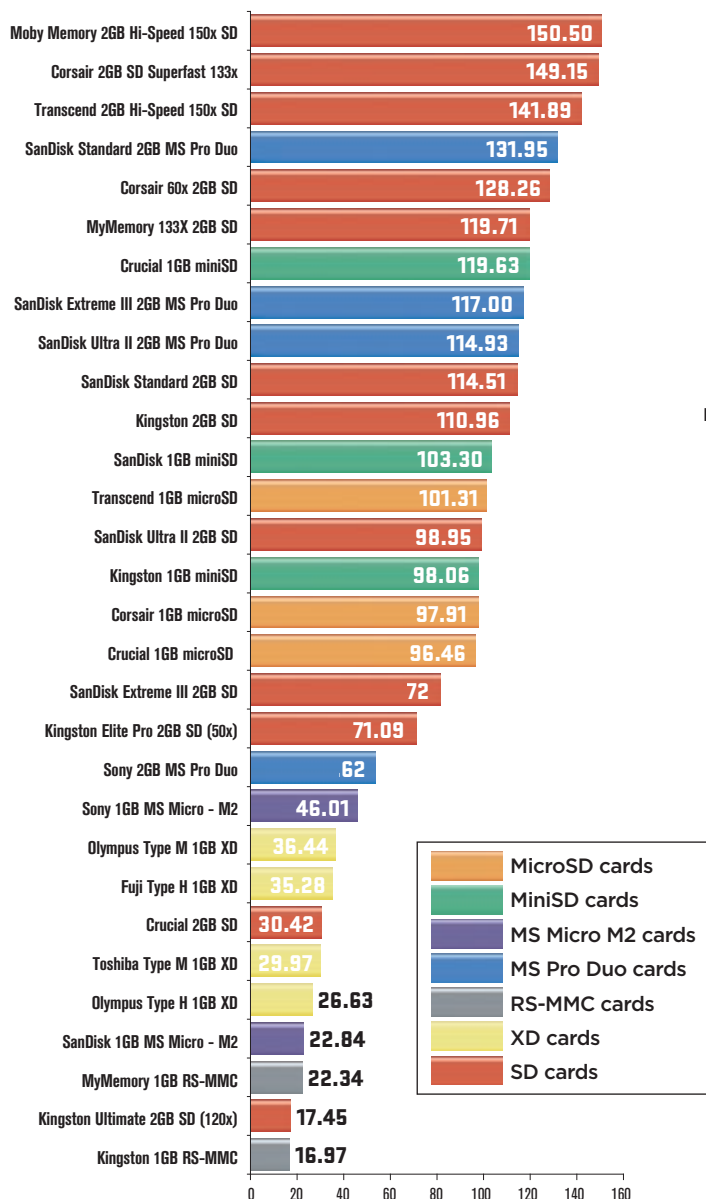
to shoot 30 pictures with each card. These times were converted into frames per second (fps). We tested SD cards using a Nikon D40, rated at 2.5fps, and Memory Stick cards using a Sony Alpha A100, rated at 3fps. There is no equivalent DSLR camera that accepts xD cards, so we used a FujiFilm FinePix F20, rated at 0.7fps.

This testing method means that our continuous results aren't comparable between card formats, but they are useful for illustrating the speed differences within each format. Some cards were able to store pictures as fast as the camera could generate them, but others slowed down the camera as they struggled to keep up.

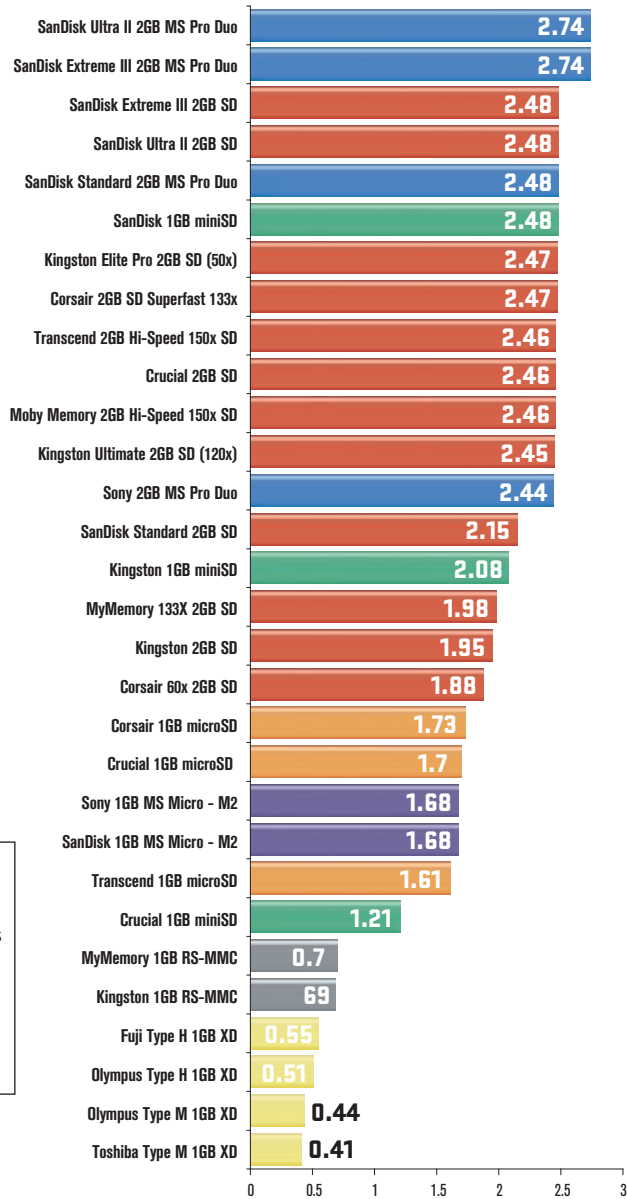
BENCHMARKS

Reaction speeds File delete and continuous photo tests

File delete test (MB/s)



Continuous photo test (fps)



Labs verdict Memory cards

Some of the memory cards in this test are very cheap, but buying the cheapest can be a false economy. By paying a little more you can often get a card that's far faster and excellent value.

Happily for those who want a microSD card, the cheapest is the best. Crucial's 1GB MicroSD is fast, and costs just £8. If you need a miniSD card, we recommend SanDisk's miniSD card 1GB. At £13 it costs a little more than the

alternatives, but can write data far more quickly. Both win Best Buy awards. Both RS-MMC cards did well, but MyMemory's MMC Mobile 1GB just edged ahead in our tests. It's our Best Buy.

Neither of the two Memory Stick Micro M2 cards in this test impressed us. SanDisk's card is slow, and at £27 Sony's faster card is expensive. Memory Stick Pro Duo cards are expensive, too. SanDisk's Ultra II Memory Stick Pro Duo 2GB is

the best of the bunch, and wins our Best Buy award. XD cards lag behind other formats, but Fuji's XD Type H 1GB is the best of the bunch at just £10 for 1GB. It's our Best Buy.

Several SD cards that cost between £15 and £25 are fast and good value, but Corsair's 2GB Secure Digital Superfast 133X is particularly good. It's fast and fairly cheap, and wins our Best Buy award.

MICRO SD CARD	MINI SD CARD	RS-MMC CARD	MS PRO DUO CARD	XD CARD	SD CARD
CRUCIAL 1GB MicroSD 	SANDISK miniSD card 1GB 	MYMEMORY MMC Mobile 1GB 	SANDISK Ultra II MS Pro Duo 2GB 	FUJIFILM XD Type H 1GB 	CORSAIR 2GB Secure Digital Superfast 133X